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Pamphlet 600-63-5

The Army Health Promotion Program

# **“Fit to Win” Physical Conditioning**

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# ***SUMMARY of CHANGE***

DA PAM 600-63-5

"Fit to Win" Physical Conditioning

Not applicable.

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## The Army Health Promotion Program

### “Fit to Win” Physical Conditioning

By Order of the Secretary of the Army:

CARL E. VUONO

*General, United States Army  
Chief of Staff*

Official:

R. L. DILWORTH

*Brigadier General, United States Army  
The Adjutant General*

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**Summary.** Not applicable.

**Applicability.** This guidance applies to installation commanders and members of installation/community health promotion councils. This includes but is not limited to: Director of Personnel and Community Activities (DPCA); Director of Logistics (DOL); Public Affairs Officer (PAO); Chief, Family Support Division (FSD); Chief, Community Operations Division (COD); Commander, Medical Treatment Facility (MTF); Director, Plans, Training, and Mobilization (DPTM); Civilian Personnel Officer (CPO); Chief, Community Mental Health Service (CMHS); Chief, Community Relations Division (CRD);

Alcohol and Drug Abuse Prevention Control Program (ADAPCP) Officer; Field Director, American Red Cross (ARC); Dietitian; Community Health Nurse (CHN)/Nurse Practitioner.

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## I. Purpose.

To provide local installation commanders with state-of-the-art physical conditioning information which will assist them in implementing the health fitness program.

## II. Applicability.

This guidance applies to installation commanders and members of installation/community health promotion councils. This includes but is not limited to: Director of Personnel and Community Activities (DPCA); Director of Logistics (DOL); Public Affairs Officer (PAO); Chief, Family Support Division (FSD); Chief, Community Operations Division (COD); Commander, Medical Treatment Facility (MTF); Director, Plans, Training, and Mobilization (DPTM); Civilian Personnel Officer (CPO); Chief, Community Mental Health Service (CMHS); Chief, Community Relations Division (CRD); Alcohol and Drug Abuse Prevention Control Program (ADAPCP) Officer; Field Director, American Red Cross (ARC); Dietitian; Community Health Nurse (CHN)/Nurse Practitioner.

## III. Background.

The benefits of exercise are well documented. The positive relationship of exercise to weight control, stress management, cardiovascular disease risk reduction, injury prevention, and many other aspects of health is so overwhelming that a proper physical conditioning program is essential if the Army is to achieve its total goals.

## IV. Goals.

- a. To give installation commanders information on physical fitness which will help them promote and implement health and physical fitness post wide.
- b. To foster total Army awareness of the importance and benefits of physical fitness and the negative health consequences of not being physically fit.
- c. Increase the level of physical fitness at each installation.

## V. Responsibility.

Installation commanders have responsibility for implementing the physical fitness program. Commanders are to appoint a health promotion coordinator and establish a health promotion council to accomplish the objectives outlined in AR 600-63.

## VI. Module Elements.

**Table V-1**  
**Module Elements**

The program is comprised of these areas:	
Assessment	Annex A
Cardiorespiratory Health Screening	Annex B
Program Implementation	Annex C
Program Evaluation	Annex D
Safety Considerations	Annex E
Healthy Back	Annex F
Pregnancy and Exercise	Annex G
Muscular Fitness	Annex H
Information Program	Annex I
Strength Facility Considerations	Annex J
Resources	Annex K

**Table V-2**  
**Suggested Elements for Level 1-2-3 Fit To Win Programs**

Modules	Level 1 Program	Level 2 Program	Level 3 Program
<b>Commander's Guide</b>	Introductory Chapter Strategies for program management, and resources	Same as Level 1	Same as Level 1
<b>Marketing</b>	Unit briefings Post media Community needs assessment Posters, slides, videotapes Incentives. — Personal recognition certificates — Awards Evaluation Strategies	Level 1 plus: Guest speakers Promotional items	Level 2 plus Public relations campaigns Support groups Intramural competitions
<b>Individual Assessment</b>	Automated Health Risk Appraisal Health Risk Review Session	Same as Level 1	Same as Level 1
<b>Physical Conditioning*</b>	Community/unit based programs to include aerobic and strength development classes AR 350-15 Guidance National Fitness Month	Level 1 plus individualized prescription based on fitness evaluation	Same as Level 2
<b>Nutrition and Weight Control</b>	Pamphlets/posters brochures Media blitz for dining hall: menus National Nutrition Month AR 600-9 Guidance	Level 1 plus: Group classes Videotapes Slides/Cassette tape	Level 2 plus: Nutritional Assessment Individualized diet plans Computerized nutritional analysis Cooking classes
<b>Procedures Guide</b>	Pamphlets/Brochures/Posters Command Briefings (at least monthly) Incentive/Sustainment Program	Unit Training Schedules which reflect health promotion education classes in all areas needed	Unit Days for: Health Risk Assessment Family Health Promotion Activities
<b>Antitobacco</b>	Pamphlets/brochures Media blitz advice for smokers and nonsmokers National Smokeout AR 1-8 Guidance	Level 1 plus: Group cessation programs Videotapes Radio/TV spots	Level 2 plus: Computerized cessation program Support group
<b>Stress Management</b>	Pamphlets/brochures Posters Welcome Packets with resources within the community Sponsorship Program associated with PCSs	Level 1 plus: Group classes Videotapes Radio/TV spots Commanders session's Unit training Community Skill/Activity Classes	Level 2 plus: Individual treatment programs conducted at medical Treatment Facility
<b>Hypertension Management</b>	Pamphlets/brochures Unit level Monitoring National High Blood Pressure Month (May) Periodic B.P. checks/follow-ups	Level 1 plus: Group classes Videotapes TV, Radio spots	Level 2 plus: Individual counseling
<b>Substance Abuse Prevention</b>	Pamphlets/brochures Posters Group meetings and classes AR 600-85 Guidance	Level 1 plus: Videotapes	Level 2 plus: Individual counseling Support groups
<b>Spiritual Fitness</b>	Pamphlets/brochures Posters Opportunities to meditate, pray, or worship AR 165-20	Level 1 plus: Group meetings classes Developmental activities	Level 2 plus: Individual counseling Referral agencies Values building resources Support groups

**Table V-2**  
**Suggested Elements for Level 1-2-3 Fit To Win Programs—Continued**

Modules	Level 1 Program	Level 2 Program	Level 3 Program
<b>Dental Health</b>	Pamphlets/brochurs National Children's Dental Health Month Periodic Dental Examinations Unit Level Dental Fitness Clas- sification Monitoring	Classes Videotapes Radio/TV spots Skills Classes	Individual Oral Hygiene Counsel- ing Definitive Dental Treatment Long Term Follow-Up

Notes:

\* The exercise elements are the most likely to result in untoward events; therefore, cardiovascular screening must be required for all individuals 40 years of age and for anyone with a history of cardiovascular disease. A disclaimer is required.

## Appendix A

### Annex A

#### A-1. Assessments

This section is designed to provide valuable information about the fitness level of each individual. The assessment tools are applicable to both active duty and non active duty personnel. Individuals over the age of 40 years old must be cleared by their physician before participating in the APFT or a Fitness Assessment. There are three components to this evaluation:

- Cardiorespiratory
- Muscular strength and endurance
- Flexibility

Figure 1 depicts an overview of the Fit To Win program. Program elements occur based on the commander's resources and community needs.

#### A-2. Cardiorespiratory Performance

*a.* Cardiorespiratory performance is a measure of the individuals heart and lungs to efficiently and effectively supply the body with the blood and oxygen necessary during moderate aerobic activity. Aerobic activity is any activity which increases the heart rate to a training range and can be sustained for a period of 20 minutes or more. It can also be called Cardiorespiratory activity. To evaluate Cardiorespiratory fitness levels, the two mile run test may be used. The following equipment is necessary:

- A pre-measured 2 mile course
- Stop watch
- personnel to record scores

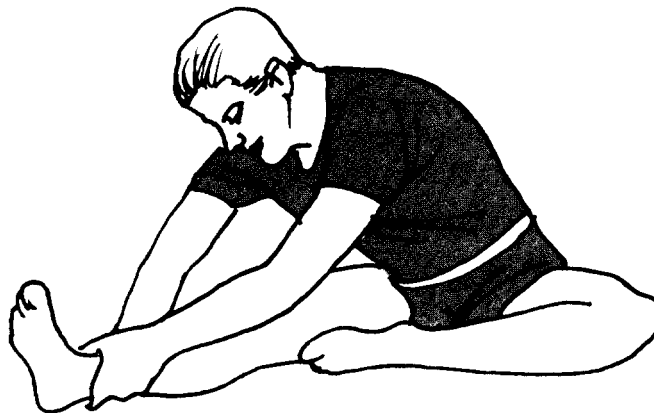


Figure A-1. Cardiorespiratory Performance

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*b.* The protocol is as follows:

The participants are instructed to walk, run, or walk/run the course as fast as they can. Their times will be recorded by supervising personnel. Participants need to be reminded to stretch and warm-up by walking for 3-4 minutes prior to the 2 mile run test. In addition, test participants should cool down, by walking, 3-4 minutes after completion of the test. Each participant should be encouraged to pace himself in order to complete the test as quickly and safely as possible.

Refer to the most recent edition of FM 21-20, Aug 85, for standards based on age and sex.

A 1.5 mile test may be used for civilian personnel as an alternative to the 2 mile test. Procedures and standards may be found in the Aerobics Way (See Annex K under Resources).



### A-3. Muscular Strength/Endurance Performance

Muscular fitness encompasses two components: strength and endurance. Strength refers to the amount of force an individual can exert in a single maximal effort. Muscular endurance is the ability of a muscle to continuously or repeatedly exert force.

a. Two tests can be used to measure muscular endurance:

- Maximum number of sit-ups in 2 minutes.
- Maximum number of push-ups in 2 Minutes.

b. Each test participant is required to complete the sit-ups or push-ups using correct form.

c. Refer to the standards in FM 21-20 to assess each individual's level of performance in push-up and sit-up tests. These standards apply specifically to the active duty soldier. Civilian members of the Army family may use the sit-up, push-up tests and standards found in The Aerobic Way book (see Annex K under Resources).

d. Strength can be measured by a one repetition max using a bench press, for upper body strength, or a leg press for lower body strength.

e. Each participant needs to warm-up before the test. Start with a low weight on the weight stack. After each lift, increase the weight by 5-10 pounds until the participant has reached his maximum and can lift no more. This is his 1 rep max. Correct form must be monitored to avoid injury.

f. In order to develop total muscular fitness, all major muscle groups need to be exercised, not just those used for sit-ups and push-ups. Refer to Annex C and Annex J for a more in-depth discussion. More information may also be found in FM 21-20.

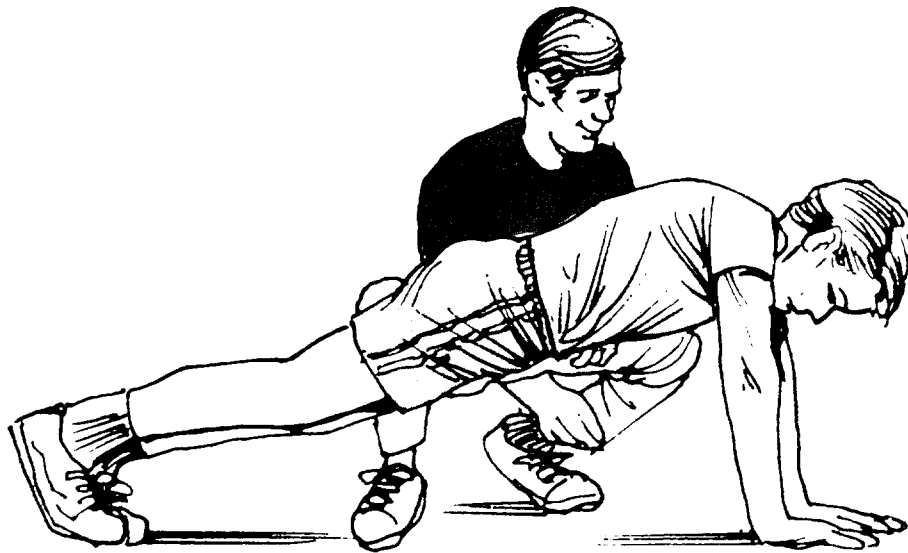


Figure A-2. Muscular Strength/Endurance Performance

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### A-4. Flexibility

a. Flexibility is the ability to move a joint through its entire range of motion, without tightness or pain. Achieving an adequate degree of flexibility is important to reduce the likelihood of injury to muscles and ligaments which support each joint, and to improve performance. Flexibility exercises are an integral part of any fitness program and need to be incorporated into the warm-up and cool down phase of each workout.

b. The sit and reach test may be used to assess an individual's flexibility, primarily in the lower back, hamstrings (back of thighs) and calves.

c. The following equipment is needed:

- A yard stick
- Tape

- A small floor area with wall accessibility
- A 12 inch high box (not imperative)

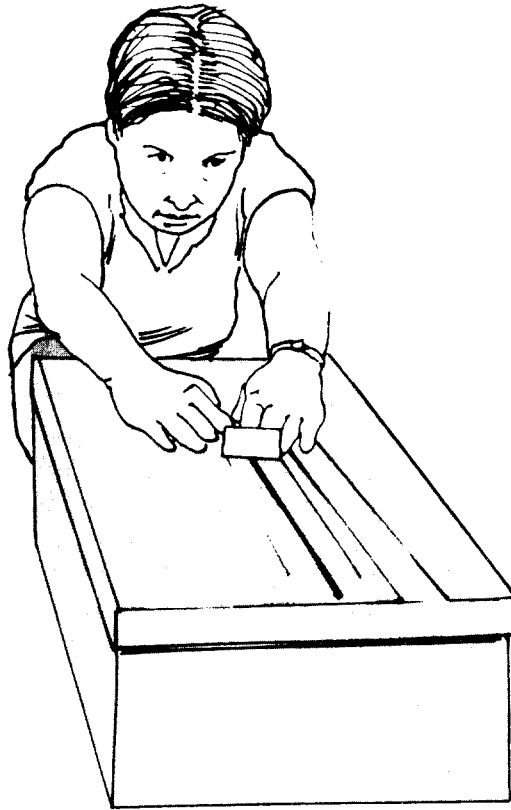


Figure A-3. Flexibility

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#### **A-5. Test Procedure.**

*a.* Individuals need to warm-up prior to the test by gently reaching for their toes with their knees slightly bent while seated. The objective is to loosen the muscles in their lower back and hamstrings to prevent muscle strains during the test.

*b.* The box should be placed against a wall for stability and the yardstick taped on top of the box so the 15 inch mark meets the front edge of the box. If a box is not available the yardstick may be placed on the floor. In either case, the participant's heels need to be at the 15 inch mark and spread apart approximately 6-8 inches. Have the individual place one hand over the other.

*c.* The subject will reach forward in a smooth, continuous motion until feeling tension but not pain. If necessary, the scorer can gently hold down the participant's knees to prevent them from bending. Do not permit the individual to lunge forward. Record the best of 3 attempts as the individuals score. Compare this score to the table below to determine the appropriate fitness category.

**Table A-1**  
**Fitness Classification Sit and Reach (inches)**

<b>Fitness Category</b>	<b>Male</b>	<b>Female</b>
Excellent	22-23+	24-27+
Good	20-21	21-23
Average	14-19	16-20
Fair	12-13	13-15
Poor	10-11	11-12

*d.* The standards used by the Army for measuring muscular and Cardiorespiratory fitness apply to those individuals between the ages of 17 to 60 years old. Norms for those younger than 17 years old can be found in the book entitled, Practical Measurement for Evaluation in Physical Education. A resource for those over 60 years old would be the book entitled, Exercise in Health and Disease. No norms for push-ups or sit-ups have been established for those over 60 years old; standards established for the 56-60 years old group for the Army Physical Fitness Test (see FM 21-20, Aug 85) may be used. Norms for body fat for those under 18 years old can be found in the AAHPERD Health Related Physical Fitness Test Manual. These three references are located in Annex K.

## Appendix B

### Annex B

#### B-1. Cardiorespiratory and Health Screening

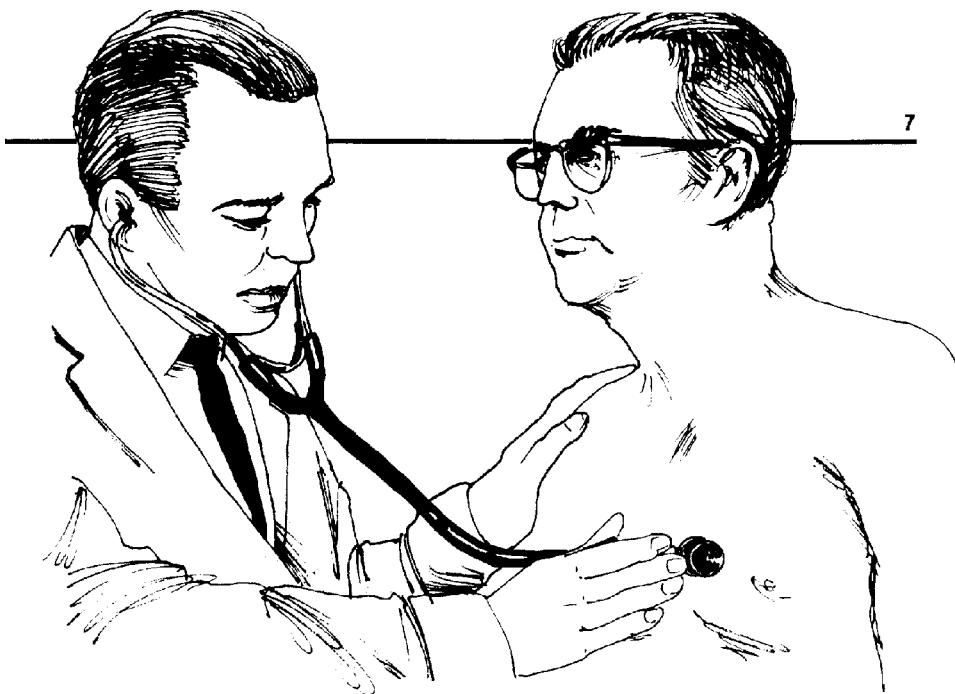


Figure B-1. Cardiorespiratory and Health Screening

*a.* Before an individual enters into a physical conditioning program such as the one described in this module, he/she needs clearance from a qualified health care provider (usually a physician). This clearance is based primarily on the status of an individual's cardiovascular health, and includes as a minimum; pulse rate, blood pressure check and listening to the individual's heart sounds by a qualified person. Additionally, the individual's Cardiorespiratory history and family history would be included.

*b.* For active duty personnel Cardiorespiratory screening takes place at the initial entry physical, during sick call, or when he turns forty years old or during a routine physical examination. Other than these times, the soldier is not screened for Cardiorespiratory status and is presumed fit and able to participate in physical conditioning programs.

*c.* It is mandatory that a soldier undergo a medical screen when he turns forty years old (as per AR 40-501 and AR 350-15). Until he/she is cleared by this medical screen, the soldier is to continue exercising at the level he was accustomed to before turning forty.

*d.* All civilian personnel who desire to participate in physical conditioning programs conducted by the installation must also receive a medical screening and clearance to reduce both risk and liability in the area of Cardiorespiratory problems. DA civilian employees need to check with program directors on post to determine if there is a mechanism by which they can be screened at the work site. If there is no provision, then the individual's private physician should perform the assessment.

*e.* If a soldier has any type of medical problem (e.g., orthopedic) which might interfere with his participation in physical conditioning or prevent him from exercising, he should make an appointment at his troop medical clinic or medical treatment facility, for an evaluation and possible referral to the appropriate health care provider.

*f.* Civilians who have medical problems prohibiting them from exercising should consult with their private physician for evaluation, treatment and advice.

## B-2. Title not used.

Paragraph not used.

## Appendix C Annex C

### C-1. Program Implementation.

Once all individuals receive a fitness assessment, they can be started on a program to improve or maintain this level of fitness. Each individual can be encouraged to fill out a goal setting form. An example of this form is given below. Fitness categories are determined by using the Army scoring tables in FM 21-20 to determine the number of points earned for sit-ups, push-ups and the run. Look at the box below for fitness categories (except flexibility—see page 6). Goal levels are determined by each participant depending on his motivation.

Goal Setting		
Fitness Area	Assessment	
Cardiorespiratory	Present level	(mins.)
	Fitness Category	(mins.)
	Goal level	(mins.)
	Fitness category	(mins.)
Flexibility	Present level	(in.)
	Fitness category	(in.)
	Goal level	(in.)
	Fitness category	(in.)
Muscular Endurance	Present level	sit-ups
	Fitness category	sit-ups
	Goal level	sit-ups
	Fitness category	sit-ups
	Present level	push-ups
	Fitness category	push-ups
	Goal level	push-ups
	Fitness category	push-ups

<b>Fitness Categories based on the Army Physical Fitness Test:</b>	
Superior:	greater than 90 points per event
Excellent:	80 to 89 points per event
Good:	70 to 79 points per event
Fair:	60 to 69 points per event
Fail:	Below 60 points per event
*Use Army Scoring Tables to determine points (FM 21-20)	

Figure C-1. Goal Setting

## C-2. Cardiorespiratory.

a. Individuals who do not pass the two mile run test must be placed on individualized programs to improve their level of Cardiorespiratory performance. Recommended aerobic training programs include Cardiorespiratory activities at least 3 days a week (frequency), at a heart rate of 60–75% of the individuals max (intensity) and maintained for at least a 20 minute period of time (duration). Each Cardiorespiratory activity must have these 4 components: frequency, intensity, duration and type. The type of the activity can vary; i.e., swimming, running, bicycling or aerobic dance exercise classes, but the exercise must be continuous and involve the large muscle groups of the body. It is preferable to exercise 4–5 days a week and a minimum of 3 days. The type of activity can vary on any given day. To see an example of this, look at the sample fitness program at the end of this section (see page 10).

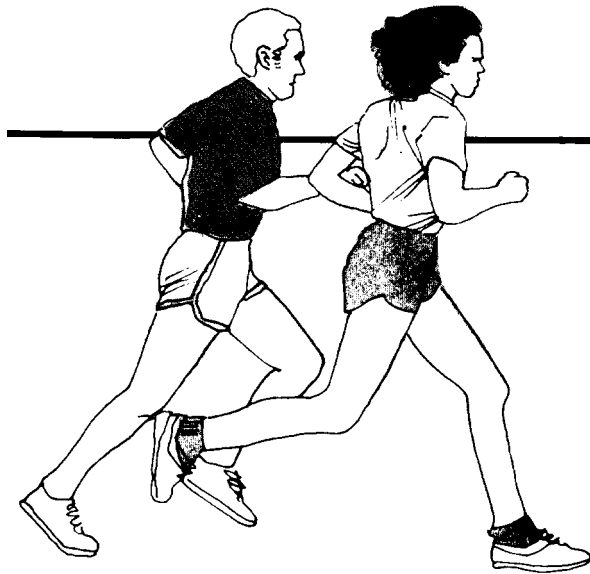


Figure C-2. Cardiorespiratory

b. To monitor exercise intensity each individual needs to find his calculated target heart rate range (THR) using the following formula:

$220 - \text{age} \times 60\% = \text{lower end of THR range}$

$220 - \text{age} \times 75\% = \text{upper end of THR range}$

Example:

$220 - 32 \text{ years} = 188 \times 60\% = 113 \text{ beats/min}$

$220 - 32 \text{ years} = 188 \times 75\% = 141 \text{ beats/min}$

**THR Range: 113–141 beats/min**

c. This means the individual should perform his Cardiorespiratory activity as a minimum at the lower end of his THR. As the participant becomes more physically fit he can increase the heart rate he performs at to the upper end of his THR range.

d. The individual should monitor his THR by finding his pulse either at the thumb side of the wrist or the carotid artery of the neck, and count the number of beats in 10 seconds. The participant always starts counting with the number 0 and should never use his thumb as the finger holding the pulse. Multiply the number of beats by 6 to get an actual THR.

e. A warm-up and cool-down should be incorporated into each Cardiorespiratory activity. A brisk walk or slow jog with stretching exercises specific to the cardio respiratory activity the individual is performing will be a good warm-up and cool-down. For example, a runner would concentrate on stretching the hamstring, quadriceps, and adductor muscle groups and a swimmer would concentrate on stretching the latissimus dorsi, pectoralis major, biceps, triceps and deltoid muscle groups.

f. The individual should learn to monitor the pace of the cardio respiratory activity, especially in the case of the 2 mile run, so that he can gradually increase speed and time of the run. It is recommended that an individual not attempt to change intensity, duration or frequency simultaneously.

g. Those persons who want to improve their fitness level can begin the “buddy system” of running with a more skilled runner or incorporate interval training into their fitness program. A running partner can be very instrumental in “pushing” an individual to extend more effort. Intervals (rapid sprints) can also improve pace, when interspersed between a runner’s average pace. Chapter 2 of FM 21–20, will provide more information on running. A good rule of thumb is to increase your distance or time by 5–10% per week. A 10% increase per week may be easy at first but later this will become very difficult. Eventually improvements will be very small as an individual approaches his limits based on his individual physiology.

### **C–3. Muscular Fitness.**

a. Strength and endurance are necessary for routine tasks of daily living. Individuals whose occupations demand lifting or handling of heavy materials require an increased level of strength and endurance. Supervisors should be looking closely at the tasks that are required of those personnel under their authority and plan a strengthening program to meet those demands. While an overall strength development program has positive health value for all participants, task/mission oriented strength programs should be emphasized.

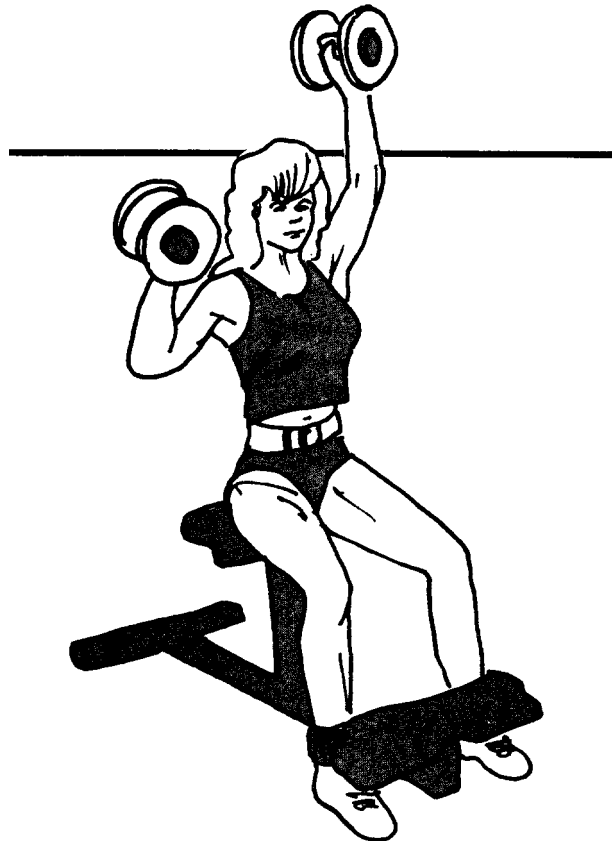


Figure C–3. Muscular Fitness

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*b.* Individuals who do not pass the push-up/sit-up test need to start on a muscular fitness program based on the overload principle. The overload principle states that the muscle must be made to do more work than it is accustomed to doing in order for the muscle to adapt to the new demand and develop greater strength and endurance.

*c.* One way to improve in push-up or sit-up performance is to have the subject do 2–3 sets of about 75% of the maximum number he can do. For example, if the maximum number of push-ups he can do is 20, then have him do 2–3 sets of 15 repetitions. By doing that, the subject will do a total of 30–45 repetitions compared to just 20 repetitions. As the subject finds it easier and easier to complete the 15 repetitions in each set, he can begin to increase the number of repetitions in each set and eventually decrease the sets from three to one as he approaches his predetermined goal. Another way to improve strength and endurance in sit-ups and push-ups is to use barbells/dumbbells or weight machines and work those muscles that are involved in pushups and sit-ups.

*d.* Remember, push-ups and sit-ups are a measure of muscular fitness of a small group of muscles. To achieve overall muscular fitness (strength and endurance), attention must be given to all the major muscle groups. Whether an individual wants to specifically improve his push-up/sit-up score or improve overall muscular fitness for health and appearance benefits, the principles of strength training are the same. In Annex H, there is valuable information on strength conditioning which is applicable to every category of personnel. FM 21–20, Chap 3 also contains information on muscular fitness.

#### **C–4. Flexibility.**

*a.* Flexibility is the ability of the muscles to stretch to their full capacity to perform work and which allows the joints to move comfortably through a full range of motion (ROM). Inflexibility of the muscles surrounding the joints leads to increased risk of injury during physical activity.

*b.* Static stretching involves slowly assuming a position where the muscle is on stretch and then holding the position for a period of any where from 5–30 seconds. Avoid bouncing movements. There are two ways to include flexibility through static stretching in a physical conditioning program, (1) as a general warm up and cool-down stretching (stretch held 5–10 seconds) before and after cardio respiratory activity and (2) as a developmental stretching (stretch held 10–30 seconds).

*c.* General static stretching is used to warm and loosen the muscle up to prepare for exercise or to cool and relax the muscles after exercise. It will lead to some increase in flexibility. The participant can use general static stretching with stretches which are specific to that cardio respiratory activity to warm-up and cool-down. As an example, a swimmer can warm-up by doing trunk side stretches, lat rotation stretches, pec pulls and tricep stretches.

#### **C–5. Example:**

*a.* trunk side stretch

(let your body weight lower to one side; keep knees bent and back straight)

lat rotation presses

(begin with arms hanging down and palm pressing backwards, raise arms in front of body to above the head while slowly rotating the palm so that when the hands are above the head the palm again presses backwards, slowly lower the arms and press palms back to original position)

pec pulls

(clasp fingers behind back and gently straighten elbows and lift until tension is felt)

triceps stretches

(reach over your shoulder towards the middle of your back with one arm; place the opposite hand on your elbow and pull back gently)

*b.* Developmental static stretching works best after a good workout where the muscles have become very warm and oxygenated. Developmental stretching done properly can lead to significant gains in flexibility. Developmental static stretches for the total body should be done every day or can be incorporated into the participants cool-down if the time allows.

*c.* In developmental static stretching the muscle is stretched gently just past the tension point. Hold the stretch for 10–30 seconds, release and repeat. Repeat as much as 7X per week to see improvement. FM 21–20 outlines and illustrates stretching techniques further.



Sample Fitness Program							
Fitness Area/Mode	Day of Week						
	M	T	W	TH	F	S	Sun
Cardiorespiratory							rest
run	X		X		X		
swim				X		X	
Strength		X		X	X		rest
Flexibility	X	X	X	X	X	X	X

Figure C-4. Sample Fitness Program

## Appendix D

### Annex D

#### D-1. Program Evaluation.

a. To determine if the fitness program is effective a reassessment is necessary. In 6-8 weeks you should be able to measure significant gains over the initial fitness level.

b. Re-test each individual using the same tests that were administered initially. If there are standards available (e.g. 2 mile run, pushup/sit-up, yard stick) you may compare re-test results against both the standard and the initial individual score. If the initial test had no standard for good, fair, poor, etc., then compare initial results with re-test results. An example of this would be strength training where the individual lifted the maximum weight possible for specific muscle groups and 3 to 4 months later, the same test was given. The standard in this case would be his/her improvement (ability to lift more weight one time) and not how well he/she did compared to others. If fitness programs are conducted properly, improvements should be seen in every area.

#### D-2. \*Note

a. There are more sophisticated methods of measuring cardio respiratory fitness, strength and flexibility levels. The methods described in this section are available to all commanders regardless of facilities, funds or manpower. Level 2 & 3 programs allow the commander to determine more precisely the fitness levels of his troops.

**Level 1:** Principles of physical training as defined in DA PAM 350-15 and 350-21, FM 21-20, AR 350-15; community based programs. Sit and reach box or yardstick.

**Level 2:** Includes all elements of level 1 plus classes by Master Fitness Trainer or a qualified instructor: Marathon Training, Weight Training, Flexibility, Circuit Training and Aerobic Dance, Triathlon Training, Power Lifting.

**Level 3:** Includes all elements of level 2 plus: Available Assessment Tools: Dynamometer, Gonlometer, Tape measure, Step test, Individual Debrief, Structured exercise classes of varied activities.

b. A level 3 program would require specially trained personnel to do assessments.

c. These three levels of health promotion programs are based on local resources and needs.

d. Each commander is encouraged to implement a health promotion program which meets the needs of his installation and within the available resources. Level one, two and three health promotion programs all satisfy the objectives set forth in AR-600-63.

e. After a comprehensive needs assessment is completed and the results from the diagnostic cardio respiratory, muscular and flexibility tests are evaluated, the commander can plan his physical conditioning program as outlined in Annex C.

## **Appendix E**

### **Annex E**

#### **E-1. Safety Considerations.**

*a.* The potential danger of injury, in each area of physical fitness, can be decreased by learning proper techniques and following safety precautions. Review of DA PAM 350-18 and FM 21-20 under the headings of strength, aerobic and flexibility is suggested for those in charge of fitness programs.

*b.* The following recommendations are applicable:

- Active duty soldiers who turn 40 years old should continue at their current level of fitness activity until they are medically screened and cleared. (See Annex B).
- Assessment is imperative before a soldier can be started on a fitness program; not everyone can start training at the same level. Progression must be gradual increasing the workload (distance, speed, weight, repetitions) too rapidly is the major cause of many training injuries.
- Recovery time (rest) is crucial if fitness gains are to be made. If a soldier is not improving or is complaining frequently about pain or fatigue he may be training too hard, and/or too often.
- People need to be taught to “listen” to their bodies (pain, ache, fatigue) and to adjust their workouts accordingly. Here are a few major tips for safety in each area of physical fitness.

#### **E-2. Cardiorespiratory.**

*a.* If individuals are not in good condition and they have been given a target heart rate to follow, then they must stay in that zone until the exercise supervisor changes it. All individuals participating in Cardiorespiratory activities must be taught the warning signs of overexertion and/or heart problems which are: extreme shortness of breath, nausea, tightness in the chest, pain in the jaw, left chest or left arm or dizziness when beginning or advancing the fitness program. If any of these signs occur, the individual should stop exercising at once and see a health care provider as soon as possible.

*b.* Alternate cardiorespiratory exercises should be performed to stress different muscle groups in an effort to reduce risk of musculoskeletal injury. See page 9 for a sample exercise program for cardio respiratory conditioning that utilizes alternate muscle groups to prevent overuse injuries (e.g. stress fractures, shin splints, tendonitis, etc.) from occurring.

#### **E-3. Strength.**

*a.* Individuals should begin lifting light weights at a level of 50-60% of their one repetition maximum (1 rep max), (see Annex A, page 5 to determine 1 rep max). They should progress slowly to a point where they are lifting a weight heavy enough to exhaust the muscle group between the 8th and 12th repetition. For example, if an individual's maximum lift was 100 pounds, then he would begin with 50-60 pounds for 8-12 repetitions. After successful completion of one set the individual can progress to 2 sets in 2 weeks. Progressing too fast can result in muscle soreness. Eccentric muscle contractions (e.g. lowering the arms after curling) can also lead to muscle soreness. The weight needs to be increased when the individual can do more than 12 repetitions and decreased when he can not do at least eight properly executed repetitions.

*b.* Safety precautions are important during strength development. Individuals should never jerk when doing resistive exercises. Correct exercise form is critical. When using free-weights at heavy loads, individuals should use a “spotter.” The lifter should never hold his breath but breathe normally throughout each repetition or exhale during the shortening phase (e.g. biceps curl) and inhale during the lengthening phase (e.g. letting the weight back down from the curl position). When lifting a weight that is below the waist, (e.g. barbell on the floor) lifters should bend their knees and keep the backs relatively straight (with a slight in curve at the lower back). Individuals should never combine bending and twisting or make fast movements with the back such as rapid twisting.

*c.* Strength training produces increases in systolic blood pressure, but is safe for healthy individuals. Persons with high resting blood pressures or other cardiovascular problems should consult with their physician.

#### **E-4. Flexibility.**

The two most common types of stretching are static and ballistic. Static stretching is the safest. The stretch is slow and progressive to prevent injury due to muscle fiber tearing. No bouncing is involved in the stretch. Ballistic stretching is not a preferred method of stretching. It is characterized by bobbing or thrusting forward with a bounce instead of a slow progressive method. Ballistic stretching can and probably will result in injury.

#### **E-7. Note:**

Inherent to program safety is having a qualified individual conduct the fitness class. As a minimum the person should be familiar with the contents of FM 21-20 and DA PAM 350-18. It is preferable to have a Master Fitness Trainer or

someone who has had fitness training lead exercise sessions. P.T. leaders should follow guidelines as described in FM 21-20.

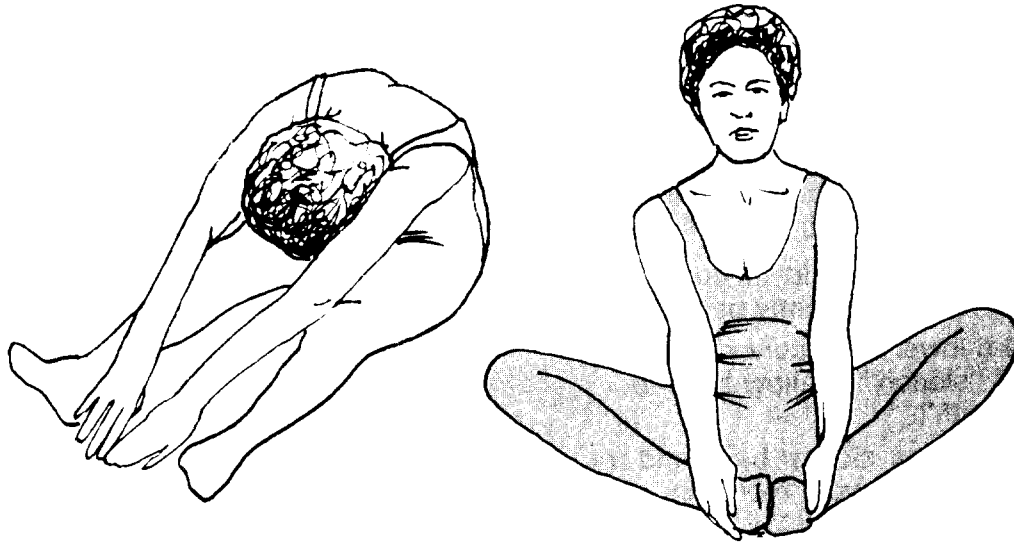


Figure E-1. Stretching

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## Appendix F Annex F

### F-1. Healthy Back.

a. It is estimated that over 80% of the population will experience at least one episode of back pain in their adult years. Studies show that billions of dollars and man hours are lost each year because of back problems.

b. There are many factors involved in the etiology of back pain and many different approaches to the treatment of back pain. One of the most encouraging and positive approaches has been the preventive/educational approach. Studies of corporations who have hired experts to teach their employees about back care and injury prevention have demonstrated reductions in injuries by 50 percent and a decrease in lost work days by 66 percent.

c. This section will not address every aspect of back care and back injury prevention but rather will focus on back care principles as they related to the three areas of physical conditioning (cardio respiratory, muscular and flexibility). If a commander desires to have a more comprehensive back care program, he should contact the hospital commander who can arrange to have a specialist implement a program according to needs.

### F-2. Basic Principles For Back Care.

a.

- It's your back and it's your responsibility to take care of it.
- back care is a 24 hour per day job.
- Know and use the proper posture for standing, sitting, sleeping, and lifting.

- Stand erect with mild “in-curve” of low back and knees slightly bent.
- Sit with lower back curved in slightly; do not “slouch” or allow back to “round off.”
- Sleep on your side or back and try not to sleep on your stomach.
- When lifting, keep back relatively straight – bend the knees and keep objects close to your body.
- Never bend over at the waist with knees straight and never combine bending with twisting.

b. Individuals with a history of back problems need not be excluded from exercise altogether. Rather, a program

must be tailored to meet the needs that a soldier has because of his back problem. This type of individual must be seen as one who still has need of and will benefit from improved cardio respiratory, muscular and flexibility fitness.

### **F-3. The Back And Cardiorespiratory Exercises**

*a.* Cardiorespiratory exercises include walking, running, biking, rowing, swimming, climbing, aerobic dance and others. The greatest danger to the back during these types of exercises is putting the back in an anatomically awkward position. For example, in running, some runners throw the left arm across their chest to the right and then the right one to the left side causing a rotation of the spine which may be harmful. Other runners lean backward putting pressure on the discs and small joints of the lower back. In aerobic dancing, the students are often instructed to bend and twist rapidly which is extremely dangerous for the back (especially the intervertebral disc). Bikers often lean forward too much and “round” off their lower backs resulting in overstretching of the ligaments there.

*b.* To minimize the risk of low back problems during cardiorespiratory activity, always maintain a good posture while participating and “listen” to your back. When low back,, symptoms of pain or aching begin, check for improper postures and avoid doing exercises that cause you to experience back pain.

### **F-4. The Back And Strength Training.**

Those who participate in strength training must be careful to protect the lower back; the added burden of heavy weights creates great stress on the lower back structures (discs, ligaments, joints, etc.). Proper form and execution of each exercise is critical — many injuries occur when a lifter substitutes incorrect motions. Lifting free weights (barbells, dumbbells) increases the possibility for low back injury if the lifter does not know how to pick up the weight from the floor. The key to back injury prevention in this case is keeping the back relatively straight (with slight “in curve” in lower back) and making the legs do the work. The use of a “spotter” also decreases the chance of injury. A spotter is a person who can help the weight lifter if the weight becomes too difficult to lift or if the lifter loses his balance.



**Figure F-1. The Back And Strength Training**

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## **F-5. The Back And Flexibility Training**

*a.* Danger to the lower back occurs with overstretching and ballistic stretching. Stretching to the point of pain means that the individual has overstretched. When this happens, stretching should be stopped immediately. If pain results from stretching but does not last more than a few moments, resume gentle stretching.

*b.* The position a person assumes when stretching is important. Standing with knees locked and bending to touch the toes or crossing the legs and rotating from side to side are postures that are dangerous to the intervertebral discs and should not be used. Sitting positions are safer and are recommended. All rotation maneuvers should be done very slowly to protect the low back structures. There are many other areas besides the back and hamstrings/calf muscle which can be stretched. Many people have tight hip, shoulder and neck muscles. The principles are the same here as for all other muscles.

*c.* Remember three key points when stretching:

- (1) Proper position.
- (2) Slow stretch — No bouncing.
- (3) Non-painful.

## **Appendix G Annex G**

### **G-1. Pregnancy and Exercise.**

*a.* Most pregnant individuals can remain physically active during the course of their pregnancy without risk of complications. In fact, studies show that women who are active during pregnancy have fewer premature births, shorter labors and fewer backaches. The first step an individual should take, if she thinks she is pregnant, is to go to a physician. Once the pregnancy is confirmed, the doctor must give guidance concerning any necessary precautions concerning exercise (AR 40-501; Chap 9-change 35 (Feb. 9, 1987)).



Figure G-1. Pregnancy and Exercise

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*b.* The pregnant individual should not be expected to perform at the same levels as before the pregnancy. (The American College of Obstetrics and Gynecology recommend a heart rate no higher than 140 and a body temperature no higher than 100 during exercise when pregnant.) During the pregnancy and in the early stages following the delivery of the baby, the pregnant individual's exercise program must be approved by a physician in order to insure maximum safety to the mother and fetus.

**G-2. Title not used.**

Paragraph not used.

## **Appendix H**

### **Annex H**

#### **H-1. Muscular Fitness.**

*a.* This annex is included because of the increased emphasis that is being given to muscular fitness at all levels of health promotion. For example, it is recognized that manual material handling tasks are found in almost every military occupational specialty and that there is a need for specific strengthening programs to reduce the risk of injury and insure job productivity. This applies to government employees as well.

*b.* Strength training can result in benefits such as increased work capacity and injury prevention for all categories of personnel in the Army Community. In particular, strength training affords the active duty soldier a greater potential to sustain his effort and perform his job under combat conditions.

*c.* Various approaches to muscular fitness are covered in FM 21-20 all of which will produce excellent strength benefits if followed. The reason that the Army does not have just one standard strength training program or one type of

standard strength training equipment is because needs, training requirements, personnel, resources and other factors vary from one installation to another.

d. In order for installation commanders and their health promotion council members to make the wisest decisions, this annex includes a chart to show, at a glance, how to exercise specific muscle groups with either free weights, universal gym or Nautilus equipment. Also, there is a short summary of what muscular fitness is and a discussion of the training variables of strength development.

## **H-2. Muscular Fitness.**

a. Muscular fitness includes the components of muscular strength and muscular endurance. They are separate but closely related components of physical fitness. Muscular strength is the amount of force a muscle or groups of muscles can exert. Muscular strength is frequently measured by a one-repetition maximum (1 RM). A 1 RM is the maximal amount of weight that can be lifted one time. Strength can vary as much as + 15 percent day to day for various reasons (illness, recovery, or fatigue). Experience indicates that individuals can lift more weight on some days than others for unknown and various reasons. Muscular endurance is the ability of a muscle or set of muscles to repeat the same movements, exert the same pressure, or maintain tension over a period of time. Two individuals are classified as being equally strong if their 1RM is the same. If required to lift 40 percent of the 1 RM for maximum repetitions, it would not be unusual if there was a considerable difference in the number of repetitions. This illustrates the difference between muscular strength and endurance. This difference may be due to individual differences in the fast and slow fibers in the muscles involved. Other variations in muscular strength can be caused by innervations or mechanical advantages provided by joint angles, limb length, muscle insertion, fiber types, muscle size, number of muscle fibers, etc.

b. The factors of strength development are:

1. Overload (stress).
2. Progressive resistance.
3. Recovery (48-96 hours).

c. Activities that place an overload on the muscles are a stimulus that cause the muscles to get stronger. The body responds by forming more contractile elements (myofibrils) within the individual muscle fibers. The number of muscle fibers in a muscle remains constant. Hypertrophy, or the increase in contractile elements, increases the cross-sectional diameter of the muscle fibers. This increases the mass of the muscle and accounts for strength gains. Individual variations exist in the number of muscle fibers and the potential or ability to increase muscular strength, but training and hereditary limits exist. For these reasons, a strength development program will not make everyone an "incredible hulk." On the other hand, atrophy, or the decrease in contractile elements, decreases the cross-sectional diameter of the muscle fibers. Inactivity will cause atrophy, and it often occurs when a limb is immobilized by a cast. Muscle mass is a variable that may increase or decrease depending on training levels. This is an important consideration in body composition and weight control.

d. Progressive resistance, or additional resistance is necessary to stimulate continued strength gains as the body adapts to initial overload levels.

e. Recovery is an essential aspect of strength development. The work bout is the stimulus, and the adaptations occur during the recovery phase. Research indicates that for maximal strength gains a muscle must be exercised every 48-96 hours. Therefore, workouts of two to three times per week are adequate. Daily workouts do not provide adequate recovery.

f. The types of equipment used in a strength development program may vary. This is often determined by the type of equipment available. The types may include Universal machines, free weights, Nautilus machines, Cybex machines, manual resistance, or various other types of machines. Strength gains can be produced by all of the types of equipment. There are various advantages and disadvantages associated with the types of equipment. Machines are easy to use, may provide variable resistance (muscles are stronger at some joint angles than others), and are generally safe to use. Free weights or manual resistance normally require a partner and include the aspect of balance. If properly organized, a strength development program will increase a soldier's muscular strength and endurance.

## **H-3. Muscular Contraction.**

a. Isometric contraction describes the tension developed by the muscle without a change in the length of the muscle.

b. Isotonic contraction occurs when the muscle shortens and lengthens against a constant resistance. Concentric contraction (positive work) occurs as the muscle shortens.

c. Eccentric contraction (negative work) occurs as the muscle lengthens.

d. Isokinetics are dynamic muscular contractions which involve a constant time period in which contraction is performed. It should be noted that it is the limb rather than the muscle that is moving at a constant rate. A special machine is required to perform this type of exercise (Cybex, Biodex, etc.).

#### H-4. Ten Training Variables of Strength Development.

1. Number of Repetitions: Research has shown that maximum strength gains result by performing 8–12 repetitions, provided the individual exercises to the point of momentary muscular failure. The point of failure has been reached when the individual can no longer properly perform the exercise. The individual should move the muscle through the entire range of movement to insure muscular strength is fully developed and also to prevent possible injury and loss of flexibility. The muscles, and not momentum, should perform the work. It should take approximately 2 seconds to raise the weight and 4 seconds to lower the weight. This will insure that the weight is raised and lowered in a smooth, controlled manner and the muscle is worked completely.
2. Duration of Repetitions: Insure that the muscles, not momentum or gravity, do the work. Use approximately 2 seconds to “raise” the weight and 4 seconds to “lower” the weight. Negative exercises such as push-ups and pull-ups done from the start position should be done in 8 seconds. Lowering the body down in 8 seconds will stimulate the muscle throughout the full range of motion for those people unable to perform the entire exercise.
3. Number of Sets: A properly performed single set of repetitions will produce a greater increase in strength than multiple sets which are improperly performed. How you perform the exercise is more important than how much exercise you perform. If using Universal or free weights, two sets should be performed. One set is recommended for Nautilus equipment.
4. Workload: The workload is simply the amount of weight to be used. The workload selected, often referred to as the resistance, should produce momentary muscular failure between repetitions 8 and 12. If the individual cannot perform eight correct repetitions, the resistance is too heavy. If the individual can perform more than the 12 repetitions, the resistance is too light. As the individual gains strength, the number of repetitions will increase. Weight must be added to keep the individual within the 8–12 repetition range.
5. Range of Motion: Properly executed strength training exercises will enhance flexibility. Move the joint through its full range of motion. For example, if you are doing biceps curls, bend the elbow fully and straighten it out completely with each repetition. Do not lock the joint.
6. Breathing: Breathe normally and rhythmically while doing your training program. Holding your breath during lifting will increase blood pressure, strain the heart and may cause dizziness, headaches, and nausea.
7. Time Between Exercises: You should move from one exercise to the next as quickly as possible in order to preserve time. Approximately 1½ to 2 minutes is probably sufficient for the average individual to recover before moving to another exercise. Longer rest periods are acceptable.
8. Recovery Time Between Workouts: To improve the strength and endurance of a muscle, it must be exercised every 48–96 hours. Exercising the same muscle or muscle group every day will not allow adequate recovery time. On the other hand, if a muscle is not stimulated through exercise every 48–96 hours, the muscle will actually begin to atrophy (lose strength). Workouts should be scheduled two to three times per week. Keep records of workout in order to analyze progress in your program.
9. Order of Exercise: The order of exercise insures a total body workout. Muscles should be exercised proceeding from the largest to the smallest. The order of exercise is legs, torso, arms, abdominals, and neck. The arm muscles are smaller and weaker than the larger and stronger torso muscles. To fatigue the muscles of the arms first would result in a nonproductive workout for the larger and stronger muscles of the torso. The abdominal muscles should be exercised after the torso and arm muscles because the abdominals stabilize the abdominal wall during the performance of most exercises. To fatigue the abdominals first would hinder the performance of an exercise in which the abdominals are needed in a stabilizing role.
10. Exercise To Be Performed: The basic consideration is to choose exercises that will develop specific muscles with the equipment available. Most strength development programs on Army posts may be limited to the use of Universal or free weights. Getting Stronger by Bill Pearl provides instructions and illustrations for free weights, Universal machines, and Nautilus machines (see Annex K under resources).

**Table H-1**  
**Strength Training Chart**

Muscle Group	Free Weight Barbells/dumbbells	Universal Gym	Nautilus
Buttocks/back	Squat (only to 90 degree)	Leg Press	Hip and Back Machine; Leg press
Quadriceps (front of thigh)	Squat	Leg extension	Leg extension
Hamstrings	Leg curl with weight boot; squat	Leg curl	Leg curl
Calves	Heel raise	Toe press on leg press machine	Heel raise on multi-exercise machine
Pectoralis (chest)	Bench press; Dumbbell files	Bench press; Parallel dip	Bench press; Double chest machine; Decline press; Arm cross



**Table H-1**  
**Strength Training Chart—Continued**

Muscle Group	Free Weight Barbells/dumbbells	Universal Gym	Nautilus
Latissimus	Bent-over rowing; Bent-arm pullover; Stiff-arm pullover	Pull down on lat.	Neck-torso-arm machine; Super pullover machine; Chin up on multi-exercise machine
Deltoids	Press; Press behind neck; Up-right rowing; Forward raise	Seated press	Double shoulder machine; Seated press; Rowing machine
Trapezius Biceps	Shoulder shrug Curl	Shoulder shrug Standing curl; Chine up	Neck and Shoulder machine Compound cur machine; Multi Curl Machine
Forearms	Wrist curls	Wrist curls	Wrist curls on multi exercise machine
Abdominals	Partial sit-up; Sit-up; Sit up with dumbbells; Oblique sit-up; Leg lifts with lower back flat; Side bend with dumbbells	Partial sit-up; Sit-up; Oblique sit-up; leg lifts with lower back flat	Partial sit-up; Sit-up; Oblique sit-up; Leg lifts with lower back flat
Neck	*Neck bridge	*Neck harness	*4 way neck machine Rotary neck machine

Notes:

\* Neck bridging and heavy resistance exercise for the neck are discouraged because of the potential for injury to the cervical spine joints, discs and small muscles.

## Appendix I

### Annex I

#### I-1. Information Program

Physical fitness, like all other aspects of the health promotion program, must be well publicized for the installation community to become aware of the need for physical fitness. The following are suggestions which might be utilized to increase public awareness of physical fitness.

- Health Fair, sports medicine or running clinics.
- Strength training clinic.
- Articles on fitness in the post newspaper.
- Posters on unit bulletin boards and posters in the commissary/PX.
- Fitness pamphlets down to company level.
- Fun runs or fun walks (volksmarches).
- Mobile fitness team or a well known personality (e.g., football or track star) to highlight a fitness day or health fair.
- Incentives and awards for fun walk/run.
- Items sold to raise money for a fitness related project such as T-shirts with slogans on physical fitness.
- Fitness talks by local experts at officers call and at CG briefings and other, lower level briefings.
- Army Community Service and the Wives Club to spread the news of fitness activities and benefits.
- Posters on safety (water safety, safe lifting techniques, etc).
- Site visits by Mobile Training Team from Soldier Physical Fitness School.

#### I-2. Incentives.

The benefits of being fit are well documented. Nevertheless, methods to encourage participation and reward effort should be part of each program. Studies show that initial sign up for exercise programs is relatively easy, but adherence is difficult. Incentives may help initial program interest and also serve to foster awareness of existing programs. Listed below are a few ideas for incentives. You can use any legitimate means at your disposal to encourage involvement in physical fitness activities.

T-shirts given away at the conclusion of the race.

Special T-shirts for those in a unit who meet certain standards of fitness (as measured by APTF Scores)

Badges for those reaching a specified level of fitness.

3 or 4 day passes for soldiers who reach predetermined fitness criteria.

Longer lunch hours for those who continue with a fitness program as measured by a run, walk, bike or swim log book.  
Commander's trophy for best P.T. score for a unit.

Post-wide competition in push-up, and sit-up, 2 mile run. The post-commander can be in attendance and special recognition (medals, trophies, certificates etc.) be given to the winner.

Special guest speakers can be available to discuss their successful involvement with physical fitness.

Presidential Sports Award: This incentive program is simple, easy to administer and addressed in AR 215-2, paragraph 6-33. Morale Support Activity may have funds to support interested participants. For information, write to:

Presidential Sports Award

AAU

P.O. Box 68207

Indianapolis, IN 46268

or call Mr. Tom Leix at (317) 872-2900

## Appendix J

### Annex J

#### J-1. Annex J.

Paragraph not used.

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#### Equipping a Strength Training Facility Soldier Physical Fitness School Fort Benjamin Harrison, IN 46216-5690

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1. In order to purchase the safest, most durable, physically effective and attractive equipment for strength training, individuals responsible for developing, organizing and equipping fitness facilities must devise a systematic plan. For many installations this is a real challenge, especially considering resource limitations.
2. The main factors to consider when updating an older facility or outfitting a new facility are:
  - a. How much space is available for strength training?
  - b. What equipment is on hand and what condition is it in?
  - c. How much money is available for purchasing new equipment over the next 6, 12, 24 months and beyond?
  - d. How many personnel will train in this facility during peak usage times and what is the make-up of the eligible community population (active forces, Reserves, retirees, family members, DOD civilians)?
  - e. Are building improvements or additions a viable option?
3. In most cases money or space will be the limiting factor in improving fitness facilities. In many cases the project will have to be completed in stages as additional funds and/or space become available and as usage increases.
4. In order to obtain the most cost-effective equipment, a basic understanding of the types of strength training equipment is necessary. Strength training equipment can be broken down into three major categories: free weights, multi-station machines, and single station machines. The latter two categories can be further divided into variable, constant, accommodating and isokinetic resistance. A full discussion of the relative merits of each of these is beyond the scope of this paper. No

single mode has been shown to be consistently superior to the others. Of the three major categories, each has its advantages and disadvantages:

##### a. FREE WEIGHTS

These include barbells (seven foot Olympic standard bars, five foot exercise bars, cambered curling bars), dumbbells, weight plates and the associated benches, platforms, and racks.

##### Advantages

- (1) **Cost** — This equipment is by far the lowest in cost in relation to any weight machines, particularly single station models.
- (2) **Durability** — Free weights require little or no maintenance and remain serviceable virtually indefinitely.
- (3) **Versatility** — A literally infinite number of exercises can be performed using free weights to condition all muscle groups. Virtually all exercises performed on machines can be duplicated using free weights; however, the opposite is far from true. Furthermore, exercises with free weights can be done through a full range of motion regardless of body type or the height of the individual training. Although most machines on the market have adjustments for various body sizes, often these adjustments do not properly or completely accommodate all individuals.
- (4) **Training Effectiveness** (transfer of strength/endurance developed through training to the actual job or athletic task performance): Very few machines duplicate the 3-dimensional multi-joint movements that are encountered in sports, athletic activities, or on-the-job task performance. Although no definitive studies have been conducted in this area, it is the overwhelmingly

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Figure J-1. Annex J

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accepted conclusion of the strength/power athletic community that strength/endurance increases produced by training with free weights are more easily converted to improvements in actual task performance than strength gained by training on other types of equipment.

#### Disadvantages

- (1) Time: A free weight workout is generally more time consuming and therefore, less practical for training large groups of personnel at one time if the weights have to be changed frequently for different exercises and different individuals. More supervision is another requirement, particularly for less experienced trainers. However, highly effective workouts for the entire body can be accomplished fairly rapidly using several sets of relatively few exercises such as the (a) bench press, (b) squat, (c) chin up, dead lift, or high pulls, and (d) parallel bar dip or military press.
- (2) Security: Free weights must be secured against theft; they are easy to remove from the weight room.
- (3) Safety: Many exercises with free weights require a spotter for safety. Machines have an "automatic spotter" built in (generally you can't get "stuck" under a machine). Common sense suggests that the lack of an "automatic" spotter with free weights would tend to make their use somewhat less safe than the use of machines. However, no scientific study to date has reported that use of free weights results in a greater number of severity of injuries than training with machines. Nevertheless, adequate instruction and supervision, rarely seen in fitness facilities, are

particularly critical with free weights for maximizing both safety and training effectiveness.

- (4) Preference: With successful advertising campaigns launched by manufacturers and health clubs, many soldiers may be encouraged to train if the modern multi- and single-station machines are provided. Commercial fitness centers find that clean, well-maintained single- and multi-station machines attract and hold the interest and participation levels of the general public better than free weights alone. Free weights, on the other hand, in addition to the infinite variety they provide, have more appeal to the more serious and experienced strength trainers and body builders, and thus still compare favorably with machines in this category.
- (5) Space: Space requirements are generally comparable to those for single station machines (i.e., it takes approximately the same amount of space for a barebell/dumbbell exercise as it does for a single station exercise machine).

#### b. Multi-Station Exercise Machines (Machines that can be used simultaneously for multiple exercises).

##### Advantages

- (1) Cost: Cost is low in relation to single station machines, but still higher than free weight equipment.
- (2) Durability. Although there are variations in quality among manufacturers, in general this type of equipment has proven to be highly durable, particularly when properly maintained.
- (3) Versatility. All major muscle groups can be exercised, although the potential for varying the exercises is limited in comparison with free weights.

Figure J-1. Annex J —Continued

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- (4) Space: In general, space is utilized most efficiently with this type of equipment.
  - (5) Practicality: Groups of individuals can train on the equipment simultaneously. In most cases only the weight stacks are adjusted as opposed to the seat position on many single station machines. This easy adjustment facilitates rapid training of large number of soldiers.
  - (6) Preference: These machines are heavily used by all categories of athletes in many gymnasiums and military fitness facilities.
  - (7) Safety: With proper instructions these machines are safe and reduce the need for a spotter. Instruction and supervision are still critically important.
- Disadvantages
- (1) The number and variety of exercises are limited in relation to free weights, especially for advanced personnel. Furthermore, some of these machines do not exercise a muscle through as full a range of motion as free weights or some single-station machines.
  - (2) Slightly more maintenance is required than for free weights.
- c. Single-Station Exercise Machines (Cybex Eagle, Keiser, Universal, David, Nautilus, Polaris, Hydra-Fit, or machines of similar quality)
- Advantages
- (1) Practicality: The seat bottom and/or back pad as well as the resistance can be simply adjusted to fit most users.
  - (2) Versatility: Machines are made to exercise all major muscle groups through the full range of motion both in isolation and with other functionally associated muscles.
  - (3) Personal Preference: Most novices and many intermediate level weight trainers prefer this type of equipment. The training is relatively simple, comfortable, visually appealing, and from the standpoint of the general public, state-of-the-art.
- (4) Variable Resistance: With the use of cams and various leverage systems, some machines provide greater resistance at some points throughout the range of motion. The reason for this is that muscles are stronger at some points throughout the range of motion than they are at other points. By increasing the resistance at these stronger points the apparatus theoretically eliminates the "sticking point" in the range of motion, thus providing greater benefits than can be gained by the same exercise using non-variable resistance (either machines or free weights). Similar hypotheses have been proposed for accommodating resistance devices which, through electrical, hydraulic or pneumatic systems, permit a muscle to exert its temporary maximum force throughout the range of motion for every repetition. Currently, objective, scientific research has not substantiated these theories and claims. More research is necessary before these factors can truly be considered an advantage.
- Disadvantages
- (1) Cost: Single-station machines represent the highest relative cost category of equipment for total body conditioning.
  - (2) Maintenance: The size, number, and relative complexity of single-station machines require the most comprehensive maintenance program resulting in the highest total maintenance costs.
  - (3) Space: Single-station machines require more square footage per exerciser than multi-station machines and approximately the same amount

Figure J-1. Annex J —Continued

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as an equal number of free weight exercise stations.

5. Formulating a Plan

- a. The ideal strength training facility should offer a variety of equipment from each of the three major categories and enough equipment from each category to meet comprehensive conditioning objectives. The equipment should be placed inside a facility that is clean, well lighted, ventilated (preferably air-conditioned, an important maintenance factor), and mirrored (to maximize motivation, and promote correct exercise form). The facility should be supervised to encourage maximum and safe usage.
- b. Steps in development of an adequate strength training facility.

Step 1. Evaluate current facilities. This evaluation includes determining the square footage currently available for strength training, making a list of serviceable equipment and the square footage it occupies and gathering current usage, preference, and requirements data.

- (a) Identify defective or unused equipment. It takes up precious space, may be a hazard, and should be removed or replaced.
- (b) Information about peak usage times can be obtained from facility managers or by monitoring useage over a period of time (1 to 3 months; be sure to include the period immediately prior to a record APFT).
- (c) Preference data can be obtained by contacting facility managers on installations similar to your own, polling regular users of the facility, and by contracting the Soldier Physical Fitness School.
- (d) Requirements data can be obtained by polling commanders, small unit leaders, master fitness trainers, and Soldier Physical Fitness School. Planners should

get a feeling for how much strength training is being neglected on a particular installation due to a lack of adequate strength training equipment and facilities. Fitness facilities have in the past been vastly under utilized for unit strength conditioning and body development.

(2) Step 2. Determine how far you are from having the ideal facility.

- a. This step includes making an estimate of the equipment required and the square footage necessary to safely place this equipment. This can vary significantly for single-station machines depending upon the manufacturer. A twelve station set of Eagle machines, for example, can safely be placed and easily used in a dayroom sized area of less than 400 square feet. Universal equips a standard 48' x 12' trailer with 18 machines, including 2 cycle ergometers, a treadmill, and a rowing machine. Some machines might require 10-25% more space. Thirty or more machines can be safely placed and used in an area the size of a racquetball court (800 square feet).
- b. Estimate the cost of the equipment. Enclosure 2 provides you with square footage templates and appropriate cost information.
- c. Estimate costs of essential and cosmetic improvements to facilities, such as flooring, painting, mirrors, ventilation systems, etc.
- d. Coordinate with post engineers. Many items such as benches, pull-up bars, dipping bars, power racks, lifting platforms, weight racks, etc., can be constructed at a very low cost by post engineers.

(3) Step 3. Long Range Planning

After completion of Step 2, the dollar and space requirements for equipment and weight room improvements should be apparent. If substantial improvements are required, it may

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Figure J-1. Annex J —Continued

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be necessary to spread them over a period of years and complete the project in stages.

Step 4. Prioritization of Equipment Acquisition.

- (a) Priority 1: Acquisition of locally provided strength training equipment. This includes equipment that can be made by post engineers or in some cases by the units themselves. At a relatively low cost, items such as pull-up bars, parallel bar dipping stations, rope climbs, exercise benches, weight racks, and weight platforms can be obtained by utilizing installation assets.
  - (b) Priority 2: In most cases, the purchase of a multi-station exercise machine is the next priority. These machines accommodate from 10 to 20 soldiers at the same time depending on which particular unit is purchased. They are reasonably priced, durable, provide a lot of variety, and require little space.
  - (c) Priority 3: Supplementing the multi-station unit with free weights equipment is the next priority. Include barbells, dumbbells, benches, racks, and platforms. At least one barbell set should be Olympic standard set. Fixed weight barbell's ranging from 20-120 pounds in 10 pound increments and a rack to hold them are a high priority. Dumbbells can be added to 110 pounds (depending upon the needs of the users).
  - (d) Priority 4: Single-station exercise machines are by far the most costly and require the most space. Once a facility has met its minimum requirements, acquisition of ten to fifteen single station machines is the next step. These machines should be selected for each of the major muscle groups. Based on available resources, the priority for purchasing individual machines should be: squat, low back/trunk extension, chest press, leg curl, pulldown or row, leg extension, overhead press, triceps extension, biceps curl, multi-purpose (such as Nautilus multiexercise), rotory-torso, four way flexion/extension/abduction/adduction.
  - (e) Priority 5: Once a facility has met its minimum requirements, additional items should be added to meet user demands. Exercise bicycles, aerobic rowing machines, and treadmills add variety and are excellent supplements to any exercise program. Purchasing multiples of items that receive heavy usage is also important.
6. Other Considerations.
- (a) Environment within a facility (heat, cold, humidity), usage factors, mission supported units, maintenance and supervisory personnel impact on the planning process. The impact that these and other factors have will vary depending on the situation.
  - (b) Do not be mislead by manufacturer's claims. The information provided herein tends to be generic in nature. At any time, but especially when significant purchases are being considered, requests for specific information can be directed to the Soldier Physical Fitness School.
  - (c) Regardless of the size and quality of the strength training faculty provided, the Army will continue to be challenged by the difficulty of unit strength training. The Soldier Physical Fitness School is currently developing ideas for providing effective strength training for large numbers of soldiers in a short period of time. These ideas along with specifications for construction will be published and distributed to the field at a later date.
7. Enclosure 1 provides example of how to equip a small (1500 sq ft), medium (2500 sq ft), and large (5000 sq ft) strength training facility. Enclosure 2 provides planning templates for rough square footage and cost requirements for various types of equipment. Enclosure 3 provides a summary of related factors to consider.

Figure J-1. Annex J —Continued

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8. For additional references, consult the two-part article entitled, "Upgrading your Conditioning Facility: Equipment Evaluation and Selection", which appeared in the *The National Strength and Conditioning Association Journal*, Volume 4, Number 1 (January), pp 1-4 and Number 2 (July, pp 1-2, 1985). *Athletic Business*, an excellent monthly magazine directed toward those whose responsibilities include planning, financing and operating athletic/recreation/

fitness programs and facilities, is available without charge to professionals in these fields from Athletic Business Publications, 1842 Hoffman Street, Suite 201, Madison, WI 53704.

9. The Soldier Physical Fitness School at Fort Benjamin Harrison can provide additional specific guidance on a case-by-case basis to any interested facility or installation. Soldier Physical Fitness School points of contact are MAJ Jim Wright (AV 699-4628) and Mr. Ed Tarantino (AV 699-4947).

## Sample Facilities

The following lists of equipment will meet minimum requirements for small (1500 sq ft), medium (2500 sq ft), and large (5000 sq ft) strength training facilities.

Estimated square footage requirements and cost data will vary depending on the manufacturer of the equipment.

<b>Small Facility (1500 sq ft)</b>	
<b>Equipment</b>	<b>Approximate Cost</b>
A. Multi-Station Exercise Machine (Approximately 10-14 Stations)	8,000.00
B. (1) Squat Rack	750.00
C. (1) Weight Lifting Platform	300.00
D. (2) Olympic Barbell Sets (180 kg)	600.00/300.00 ea
E. (1) Set Fixed Weight Barbells, 20-100 lb increments.	940.00
F. (2) Flat Benches (no supports)	270.00/135.00 ea
G. (1) Flat Bench w/supports	275.00
H. (1) Incline Bench w/seat (no supports)	230.00
I. Incline Bench w/seat and supports	275.00
J. (2) Abdominal Boards	260.00/130.00 ea
K. (1) Curling Bench	100.00
L. (2) Dipping Bars	150.00/ 75.00 ea
M. (1) Chin-up Bar or (Chin-up Trainer)	100.00
N. (1) E-Z Curl Bar	75.00
O. (2) Weight Plate Racks	120.00/ 60.00 ea
P. (1) Exercise Bicycle	600.00
Q. (1) Dumbbell Set 5-75 lbs w/rack (in 5 lb increments)	700.00
<b>Approximate Total Cost of Equipment</b>	<b>\$13,750.00</b>

Figure J-1. Annex J —Continued



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**Medium Facility (2500 sq ft)**

Include all of the above equipment and add the following:

<b>Equipment</b>	<b>Approximate Cost</b>
A. (1) Olympic Barbell Set (180 kg)	300.00
B. (1) Smith Machine	1,200.00
C. Increase Dumbbell Set to 90 lbs	408.00
D. (1) Leg Sled Machine	1,395.00
E. Single Station Exercise Machines	
(1) Leg Press or Squat	3,700.00
(1) Leg Extension	2,600.00
(1) Leg Curl	1,300.00
(1) Calf (seated)	725.00
(1) Chest (compound or press)	3,700.00
(1) Shoulder (compound or press)	3,600.00
(1) Rowing (low and high pulley)	1,450.00
(1) Biceps	1,500.00
(1) Triceps	1,500.00
(1) Low Back	2,200.00
(1) Abdominal	2,300.00
(1) Neck 4-way	1,300.00
(1) Rotary Torso Machine	2,300.00
F. (1) Flat Bench w/support	195.00
G. (1) T-bar weight rower	350.00
H. (1) Exercise Bicycle	600.00
I. (1) Aerobic Rowing Machine	700.00
	\$33,350.00
<b>Cost of Small Facility Equipment</b>	13,750.00
<b>Approximately Total Cost of Equipment</b>	<b>\$47,500.00</b>

**Large Facility (5,000 sq ft)**

Add the following to medium facility requirements

<b>Equipment</b>	<b>Approximate Cost</b>
A. (1) Multi-Station Exercise Machine (10-14 stations)	8,000.00
B. (1) Squat Rack	750.00
C. (2) Weight Lifting Platforms	600.00
D. (1) Leg Sled	1,395.00
E. (2) Flat Benches	270.00/135.00 ea
F. (1) Flat Bench w/supports	195.00
G. (1) Curling Bench	89.00
H. (3) Olympic Barbell Sets (180 kg)	900.00/300.00 ea
I. (2) Weight Plate Racks	180.00/ 60.00 ea
J. (2) Chin-up Bars	200.00/100.00 ea
K. (2) Abdominal Benches	260.00/130.00 ea
L. (1) Cable Crossover Machines	1,600.00/avg
M. Increase dumbbell set to 110 lbs; add second set of dumbbells 20-60 lbs (10 lb increments)	1,000.00
N. (1) Power Rack	600.00

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**Figure J-1. Annex J —Continued**

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O. (10) Single Station Machines*	20,000.00/avg
P. (2) Exercise Bicycles	1,200.00/600.00 ea
Q. (2) Treadmills	1,600.00/800.00 ea
R. (1) Aerobic Rowing Machine	700.00
<b>Additional Equipment</b>	<b>\$41,500.00</b>
<b>Medium Facility Equipment</b>	<b>47,500.00</b>
<b>Approximate Total Cost of Equipment</b>	<b>\$89,000.00</b>

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\* Includes:

1. Low/High Pulley Row
2. Squat
3. Pullover
4. Compound Arm
5. Low Back
6. Neck/Shoulder (Shrug)
7. Leg Extension
8. Leg Curl
9. Incline Press
10. Hip flexion/extension, leg adduction/abduction

Note: For variety of training, suggest you purchase this set of single-station machines from a different manufacturer than the initial set.

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**Summary of Related Factors**

	<b>Free Weights</b>	<b>Multi-Station</b>	<b>Single Station</b>
1. Training effectiveness and transferability.	+ + +	+ +	+
2. Practicality (including time).	+	+ +	+ + +
3. Variety/Versatility.	+ + +	+ +	+
4. Preference.	+ +	+ +	+ + +
5. Safety (with Supervision).	+ +	+ +	+ +
6. Durability (including maintenance requirements).	+ + +	+ +	+ +
7. Space Requirements.	+	+ + +	+
8. Cost.	+ + +	+ +	—
9. Security.	—	+ + +	+ + +

Figure J-1. Annex J —Continued

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## Planning Templates

These strength equipment templates provide approximate cost and square footage requirements for many pieces of strength training apparatus.

Actual size and cost will vary depending on the manufacturer and time of purchase of the items.

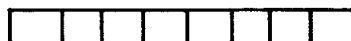
The equipment is drawn to scale (1/4" = 1'). Using standard 1/4" graph paper, strength training areas can be displayed for planning purposes.

The templates represent the actual space required for the equipment and do not include the space required for user traffic. As an example, a maximum of 40-45 personnel could safely train at any one time in the 2500 square foot facility. As a rule of thumb, allow 3' between pieces of equipment, and 1-2' between the equipment and walls. Some select pieces of equipment may be placed directly against the wall, if practical.

### Free Weight Equipment



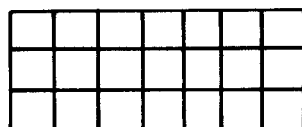
**Olympic Barbell Set**  
180 kg 14 sq ft  
\$300



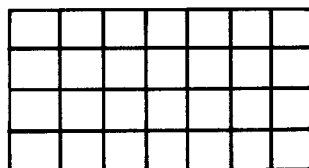
**Dumbbell Rack**  
8 sq ft  
\$200



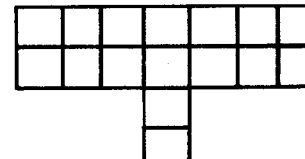
**Weight Plate Rack**  
4 sq ft  
\$60



**Power Rack**  
21 sq ft  
\$619



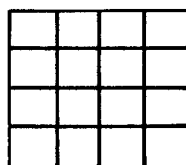
**Step Squat Rack**  
28 sq ft \$275



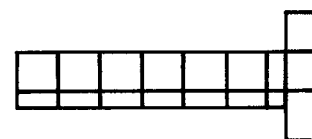
**Flat Bench w/supports**  
16 sq ft \$195



**Incline Bench**  
16 sq ft \$275



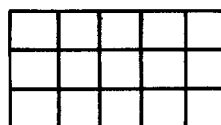
**Leg Press**  
16 sq ft \$250



**Abdominal Board**  
12 sq ft \$130



**Exercise Bicycle**  
8 sq ft \$600



**Treadmill**  
13 sq ft \$800

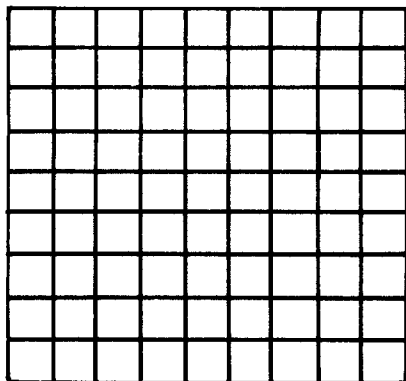


**Aerobic Rowing Machine**  
15 sq ft \$700

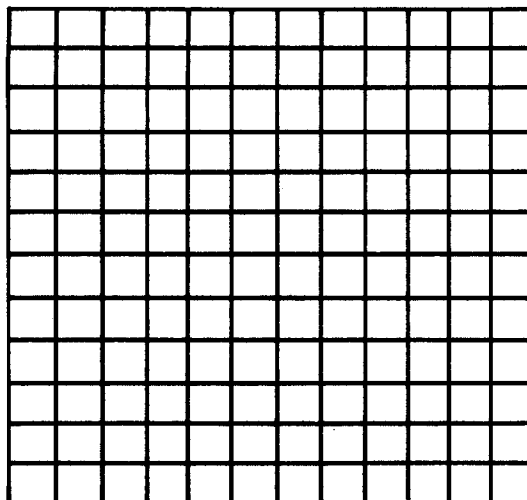
Figure J-1. Annex J —Continued

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## Multi-Station Machines

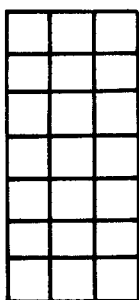


**10-14 Stations**  
81 sq ft \$8,000



**14-20 Stations**  
144 sq ft \$14,000

## Single Station Machines



**Squat Machine**  
21 sq ft \$3,700



**Leg Extension Machine**  
10 sq ft \$2,600



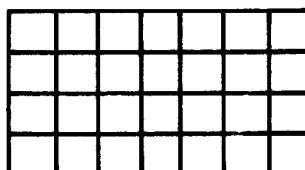
**Leg Curl Machine**  
14 sq ft \$1,300



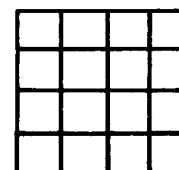
**Abduction Machine**  
12 sq ft \$1,700



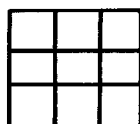
**Adduction Machine**  
12 sq ft \$1,700



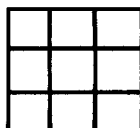
**Leg Sled**  
28 sq ft \$1,400



**Chest Pull-over**  
16 sq ft \$3,175

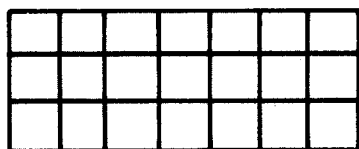


**Torso-Arm Machine**  
9 sq ft \$1,765

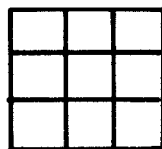


**Rowing Torso Machine**  
9 sq ft \$1,565

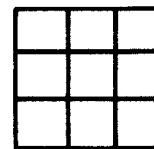
Figure J-1. Annex J —Continued



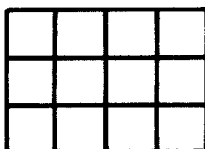
**Double Chest Machine**  
21 sq ft \$3,700



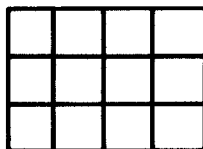
**Rotary Torso Machine**  
12 sq ft \$1,850



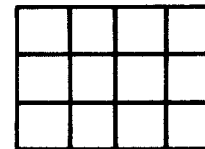
**Pull Down Machine**  
9 sq ft \$2,000



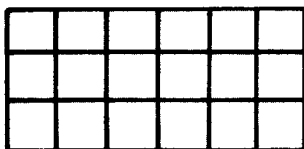
**Double Shoulder Machine**  
12 sq ft \$3,600



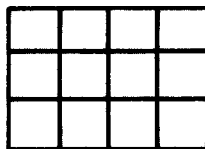
**Biceps Machine**  
12 sq ft \$1,500



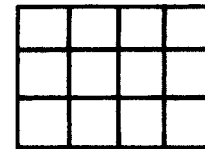
**Triceps Machine**  
12 sq ft \$1,500



**Low Back Machine**  
24 sq ft \$2,200



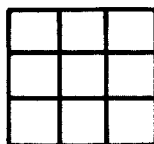
**Lateral Raise Machine**  
12 sq ft \$2,000



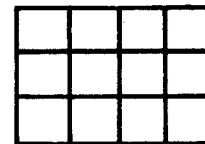
**Abdominal Machine**  
12 sq ft \$2,300



**Neck & Shoulder Machine**  
10 sq ft \$1,250



**Rotary Neck Machine**  
9 sq ft \$1,550



**4-Way Neck Machine**  
\$1,300

Figure J-1. Annex J —Continued

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J-2. Title not used.

Paragraph not used

## **Appendix K**

### **Annex K**

#### **K-1. Resources**

The following information includes suggested resources to facilitate implementation of physical fitness programs. It should be understood, however, that satisfactory levels of physical fitness can be easily attained without special resources. The minimum requirements are personnel, good running shoes, and knowledge of what to do as described in FM 21-20.

#### **K-2. Facilities and Equipment.**

A wide variety of facilities and equipment may be utilized, depending on resources and needs. They include:

- Fitness/obstacle courses
- Existing classrooms and buildings
- Swimming pools
- Stationary bikes
- Rowing machines/cross country ski machines
- Weight machines or free-weights
- Trademills
- Racquetball court, basketball court
- Lockers/showers
- Whirpools/sauna
- Dedicated installation health promotion center

#### **K-3. Personnel**

Individuals with expertise in the fitness arena, members of the Health Promotion Council e.g., Fitness Facilitator, Master Fitness Trainer or Family Fitness Facilitator.

Civilians hired for specific classes or as part time/full time health promotion coordinators.

Civilian fitness program contractor to run the fitness center.

#### **K-4. Publications**

- AR 350-15, The Army Physical Fitness Program
- FM 21-20, Physical Readiness Training
- DA PAM 28-6, Intramural Sports for the Army
- DA PAM 350-18, Individual's Handbook on Fitness
- DA PAM 350-15, Commander's Handbook on Fitness
- DA PAM 350-21, Family Fitness Handbook
- HSC Reg. 40-27, AMEDD Support of Army Total Fitness Program
- AAHPERD: Health Related Physical Fitness Test Manual, 1900 Association Drive, Reston, VA. 22091
- Anderson, B.: "Stretching," Shelter Publications, Inc., California, 1986
- Cooper K.H., M.D., MPH, "The Aerobics Way," Bantam Books/M.Evans, New York, November 1977
- Johnson, B.L., Nelson, J.K.: Practical Measurements For Evaluation in Physical Education, 3rd Edition, Minneapolis, Burgess Publishing Company, 1979
- Pearl B. Morgan, G.: Getting Stronger, Shelter Publications, Inc., California, 1986
- Pollack, M., Wilmore, J., Fox, M.: Exercise In Health And Disease. Philadelphia, W.B. Saunders, 1984

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